



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁴ : B65D 90/04, 33/02</p>	<p>A1</p>	<p>(11) International Publication Number: WO 88/ 08401 (43) International Publication Date: 3 November 1988 (03.11.88)</p>
<p>(21) International Application Number: PCT/US88/01333 (22) International Filing Date: 25 April 1988 (25.04.88) (31) Priority Application Numbers: 041,456 153,787 160,175 (32) Priority Dates: 23 April 1987 (23.04.87) 8 February 1988 (08.02.88) 25 February 1988 (25.02.88) (33) Priority Country: US (71)(72) Applicant and Inventor: REARDON, Michael, J. [US/US]; 114 Linda Circle, Marlborough, MA 01752 (US). (74) Agent: HAUG, Edgar, H.; Curtis, Morris & Safford, 530 Fifth Avenue, New York, NY 10036 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: DRUM LINER</p>		
<p>(57) Abstract</p> <p>A liner (10) for an industrial drum (18) is provided and consists of a neck (12) with an oversized containment bag (14) which when inserted within the industrial drum (18) and filled with a material will shield the drum (18) from contamination by the material.</p>		

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DRUM LINERBACKGROUND OF THE INVENTIONField of the Invention

The instant invention relates generally to industrial drums for holding materials therein and more particularly to a drum liner to be removably retained within the industrial drum.

Description of the Prior Art

Numerous industrial drums have been provided in prior art that are adapted to hold materials therein over long periods of time, which can cause the drums to corrode and spill the materials therefrom.

Further, these drums are not easily disposed of and present environmental problems when emptied of their contents.

While these units may be suitable for particular purposes, they would not be as suitable for the purposes of the present invention as heretofore described.

OBJECTS OF THE INVENTION

A primary object of the present invention is to provide a drum liner that will overcome the shortcomings of the prior art devices.

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Another object is to provide a drum liner which when inserted within the industrial drum and filled with material will protect the drum from the material.

An additional object is to provide a drum liner in which the containment bag has a low volume when the materials are removed therefrom so that the drum liner can be removed from the drum and economically disposed of, thereby making the drum itself reusable or disposable.

A further object is to provide a drum liner that is simple and easy to use.

A still further object is to provide a drum liner that is economical in cost to manufacture.

Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above related objects, this invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the appended claims.

SUMMARY OF THE INVENTION

The present invention is directed to a drum liner comprised of a containment bag connected to a neck portion. A leak proof seal is formed between the neck portion and the containment bag. The drum liner of one embodiment is preferably used in conjunction with a standard 55 gallon

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industrial drum having a threaded bunghole and an air vent. The containment bag of the drum liner is rolled-up and inserted through the bunghole. The drum liner is secured to the drum by mating external threads of the neck portion with the threaded bunghole. The liner is then preexpanded with air to allow it to unroll and then filled with material. An externally threaded bung cover is then mated with internal threads in the neck portion of the drum liner to seal the material in the drum liner.

In order to remove the material from the drum liner a standard transfer pump may be used. Thin elongated stiffeners spaced slightly apart along the walls of the containment bag may be employed to prevent the containment bag from collapsing in on itself and impeding the flow of material out of the drum liner.

In another embodiment of the present invention, the neck portion of the drum liner snap-fits into the bunghole of the drum. The drum may be of the standard type mentioned previously, or of the type having a removable cover. Removable cover industrial drums are preferred in this embodiment since they are generally made of fiberboard. The ability to practice the invention with fiberboard drums is advantageous because these drums weigh considerably less than conventional steel drums and are readily disposed of without undue cost and adverse environmental impact. An additional advantage of using removable cover drums is that the containment bag can be placed in the drum without being

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rolled-up. However, preexpansion with air prior to filling is still preferable.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURES 1A through 1C are elevational views showing various steps of a preferred embodiment of the drum liner being inserted into and removed from an industrial drum.

FIGURE 2 is a cross sectional view of the drum liner taken along line 2-2 in Figure 1B.

FIGURE 2A is a cross sectional view of the preferred embodiment of the drum liner similar to Figure 2 illustrating the containment bag in a partially collapsed position.

FIGURE 2B is a cross sectional view of the preferred embodiment of the drum liner similar to Figure 2 illustrating the containment bag in a completely collapsed position.

FIGURE 3 is a partially broken away cross sectional view of the drum liner taken along line 3-3 in Figure 1A.

FIGURE 4 is an elevational view of the preferred embodiment of the drum liner of Figs. 1-1C showing the industrial drum tipped over so that the stiffeners will prevent the containment bag from compressing onto itself.

FIGURE 5 is an elevational view of another preferred embodiment of the drum liner showing the

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interaction between a bung cover, a removable cover, a drum and the drum liner.

FIGURE 6 is a top elevational view of the removable cover associated with the drum liner of Fig. 5.

FIGURE 7 is a front elevational view of the drum liner of Fig. 5 full of material and with the liner disposed in the drum.

FIGURE 8 is a perspective view of an industrial drum with a third preferred embodiment of the drum liner.

FIGURE 9 is an elevational view showing a third preferred embodiment of the drum liner deployed within the industrial drum.

FIGURE 10 is an enlarged cross sectional view of a third preferred embodiment of the drum liner as indicated by arrow 3 in Figure 9.

FIGURE 11 is a top view of the industrial drum with a third preferred embodiment of the drum liner as indicated by arrow 4 in Figure 9 with the bung cover removed.

FIGURE 12 is an elevational view of a third preferred embodiment of the drum liner, empty and removed from the industrial drum.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, Figures 1 through 4 illustrate one preferred embodiment of drum liner 10 for an industrial drum 18 of the type that has an internally threaded bunghole 22, an externally threaded bung cover 34 and an air vent 20. The liner 10 consists of a neck 12 and a containment bag 14. The neck 12 has internal threads 28 and external threads 30 of the same general diameter. The external threads 30 engage with the internally threaded bunghole 22 in the industrial drum 18 while the internal threads 28 engage with the externally threaded bung cover 34. The containment bag 14 is for holding material 38 therein and away from the internal walls of the drum 18. The bag 14 has a mouth 15 that connects with the neck 12 to form a leak proof seal 32 therebetween.

A plurality of thin elongated stiffeners 36 may be added to keep the containment bag in a generally vertical extended position when collapsed and to prevent the containment bag 14, when full of material 38, from compressing onto itself when the industrial drum 18 is tipped over on ground line 40. If employed, the stiffeners 36 are spaced apart and vertically placed within wall 17 of the containment bag 14.

A set screw 16 may be threaded transversely through the neck 12 to hold a pipe 24 of a transfer pump 26 stationary and elevated (at distance "A" in Figure 1B) from

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the bottom 19 of the containment bag 14. This permits the transfer pump 26 to remove all of material 38 therefrom so that the liner 10 can be removed from the industrial drum 18 and properly disposed of.

The neck 12 may be fabricated out of rigid or semi-rigid inert materials, such as polyethylene. The containment bag 14 may be made from any inert, non-corrosive flexible material (e.g. polyethylene or aluminized polyethylene). If stiffeners are desired they may also be made from a rigid or semi-rigid inert material (e.g. polyethylene).

The drum liner 10 of this preferred embodiment is used as follows:

Step 1: Figure 1 shows the liner 10 before it is installed within the drum 18.

Step 2: Figure 1A shows the liner 10 installed within the drum 18 with containment bag 14 rolled-up and the neck 12 threaded into the bunghole 22 with bung cover 34 threaded into neck 17.

Step 3: Figure 1B shows the containment bag 14 full of material 38 ready to be removed therefrom by the transfer pump 26.

Step 4: Figure 1C shows the liner 10 removed from the industrial drum 18 after material 38 has been completely emptied therefrom.

Figures 5 through 7 illustrate another preferred embodiment of drum liner 110 for a drum of the type having a removable cover 102. The removable cover 102 has a bung

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access hole 122 and an air vent 120. The removable cover 102 preferably is held in place by a rim clamp 104.

The drum liner 110 of the embodiment of Figs. 5-7 consists of a neck 112 and a containment bag 114. The neck 112 has internal threads 128 that mate with an externally threaded bung cover 134. The neck 112 snap-fits securely into the bung access hole 132 thus supporting containment bag 114. The material 138 is held away from contact with the internal walls of drum 118 by containment bag 114. The containment bag 114 is connected to the neck 112 (preferably by heat sealing) to form a leak proof seal therebetween.

In order to provide additional support, stiffeners may be employed with this embodiment. However, if a sufficiently thick containment bag 114 is used, stiffeners are not generally required.

The containment bag 114 and neck 112 may be made of the same materials detailed above for the previous embodiment (Figs. 1-4). However, this configuration permits the use of a fiberboard drum with a weight approximately one-half that of a standard metal industrial drum. Additionally, these drums are more easily disposed of and provide for greater handling ease.

A conventional transfer pump will fit through the neck 112 and may be employed to remove the material 138. Alternatively, the entire drum 118 may simply be tipped on its side and the material 138 allowed to flow out by gravitational force. Once the material 138 has been removed, the liner 110 may be easily discarded. The drum

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118 may be re-used or discarded without adverse environmental impact.

The drum liner 110 of this preferred embodiment is used by:

- 1) Snap-fitting the neck 112 of the drum liner 110 into the bung access hole 122 of the removable cover 102;
- 2) placing the containment bag 114 inside the drum 118;
- 3) clamping the removable cover 102 on the drum with the rim clamp 104;
- 4) preexpanding the containment bag 114 with air;
- 5) filling the containment bag 114 through the neck 112 with material 138; and
- 6) threading the externally threaded bung cover 134 into the internal threads 128 of the neck 112 to seal the material in the drum liner.

Figures 8 through 12 illustrate a third preferred embodiment of drum liner 210 for an industrial drum 212 of the type having an off-center bunghole 214, a bung cover 216 having internal threads 218, and an air vent 220. A collar 222 is provided with external threads 224 on its top portion and an internal annular lip 226 on its bottom portion. The collar 222 is inserted into the bunghole 214 of the industrial drum 212 such that the top portion extends out from the bunghole. A neck 228, which has a circumferential annular flange 230, rests upon the annular lip 226 of the

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collar 222. The bung cover 216 can be threaded onto the collar 222 to secure the flange 230 of the neck 228 between the bung cover 216 and the lip 226. An overside containment bag 232 for holding material therein and away from the industrial drum 212 has a mouth 234 that connects, off-center, with the bottom of the neck 228 to form a leak-proof seal therebetween.

A structure 236 for properly positioning the containment bag 232 within the industrial drum 212 before filling is also provided. The aligning structure 236 includes a key 238 formed within the collar 222 that mates with a keyway 240 formed in the flange 230. When the key 238 is mated with the keyway 240, the containment bag 232 is in the proper position to compensate for the bunghole 214 being off-center. This permits the containment bag 232 to fill evenly within the industrial drum 212.

As in the other described embodiments, the liner 210 may further contain a plurality of thin elongated stiffeners 242 spaced apart and vertically placed within wall of the containment bag 232. The stiffeners are designed to keep the containment bag in a generally vertically extended position when collapsed and to prevent the containment bag 32, when full of the material, from compressing onto itself when the industrial drum 212 is tipped over.

As in the other preferred embodiments, the neck 228 is preferably fabricated out of rigid or semi-rigid inert materials, such as polyethylene. The containment bag

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232 may be made from any inert non-corrosive flexible material, (e.g. polyethylene or aluminized polyethylene). If stiffeners 244 are desired they may be made from a rigid or semi-rigid inert material (e.g. polyethylene).

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of methods differing from the type described above.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed is new and desired to be protected by letters patent is set forth in the appended claims.

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WHAT IS CLAIMED IS:CLAIMS

1. A liner for an industrial drum comprising:
 - a) a neck having internal threads and external threads of the same general diameter, said external threads being capable of engaging with an internally threaded bunghole in the drum while said internal threads are capable of engaging with an externally threaded bung cover; and
 - b) a containment bag for holding material therein and away from contact with the internal walls of the drum, said bag having a mouth that connects with said neck, to form a leak proof seal therebetween.
2. A liner as recited in Claim 1, further comprising a plurality of thin elongated stiffeners spaced apart and vertically placed within the wall of said containment bag so as to keep said containment bag in a generally vertically extended position when collapsed and also prevent said containment bag when full of material from compressing onto itself when the drum is tipped over.
3. A liner as recited in Claim 2, further comprising a set screw threaded transversely through said neck for holding a pipe of a transfer pump stationary and elevated from the bottom of said containment bag thus allowing the transfer pump to remove the material therefrom

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so that said liner can be extracted from the drum and properly disposed of.

4. A liner as recited in Claim 1, wherein said neck is fabricated out of a plastic material.

5. A liner as recited in Claim 1, wherein said containment bag is fabricated out of plastic material.

6. A liner as recited in Claim 5, wherein said containment bag is fabricated out of polyethylene.

7. A liner as recited in Claim 2, wherein each of said stiffeners is fabricated out of a semi-rigid plastic.

8. A liner for an industrial drum comprising:

a) a neck capable of being snap-fit into a bung hole in the drum, said neck having internal threads capable of engaging with an externally threaded bung cover; and

b) a containment bag for holding material therein and away from the internal walls of the drum, said bag having a mouth connected to said neck forming a leak proof seal therebetween.

9. A liner for an industrial drum of the type having a removable cover comprising:

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a) a neck capable of being snap-fit into a bung access hole in the removable cover, said neck having internal threads capable of engaging with an externally threaded bung cover; and

b) a containment bag for holding material therein and away from the internal walls of the drum, said bag having a mouth connected to said neck forming a leak proof seal therebetween.

10. A liner as recited in Claim 9, wherein said neck is made of a plastic material.

11. A liner as recited in Claim 9, wherein said containment bag is made of a plastic material.

12. A liner as recited in Claim 11, wherein said containment bag is made of polyethylene.

13. A liner as recited in claim 12, wherein said neck is made of a plastic material.

14. A method of storing material in a drum of the type having a removable cover comprising the steps of:

a) snap-fitting the internally threaded neck of a drum liner into a bung access hole in the removable cover;

b) placing the containment bag connected to said neck with a leak proof seal into said drum;

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- c) securing the removable top having the neck snap-fit therein onto the drum;
- d) preexpanding said containment bag with air;
- e) filling the lined drum through said neck with material; and
- f) threading a bung hole cover having external threads into said internally threaded neck of said drum liner to seal the material in the drum liner.

15. A drum and liner assembly comprising:

- a) a drum having a removable cover, wherein said removable cover has a bung access hole and a vent; and
- b) a liner comprising:
 - i) a neck wherein said neck snap-fits into said bung access hole; and
 - ii) a containment bag for holding material therein and away from contact with the internal walls of the drum having a mouth wherein said mouth connects with said neck to form a leak proof seal therebetween.

16. An apparatus according to Claim 15, wherein said drum is made of fiberboard.

17. An apparatus according to Claim 15, wherein said cover is made of a plastic material.

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18. An apparatus according to Claim 17, wherein said drum is made of fiberboard.

19. A liner for an industrial drum comprising:

a) a collar having external threads and an internal annular lip wherein said collar is adapted to be inserted into the bunghole of an industrial drum such that the top portion of said collar extends out of the bunghole;

b) a neck having a circumferential annular flange wherein said flange is in abutting relation with said annular lip of said collar; and

c) a containment bag for holding material therein and away from contact with the internal walls of the drum, said bag having a mouth connected to said neck to form a leak-proof seal therebetween.

20. An apparatus according to claim 19, wherein said annular flange is secured in abutting relation to said annular lip by an internally threaded bung cover threaded on said collar.

21. An apparatus according to claim 20, further comprising means for aligning said neck within said collar to properly orient said containment bag within the drum.

22. An apparatus according to claim 21, wherein said means for aligning said neck within said collar comprises:

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a) a key formed in said collar; and
b) a keyway formed in said flange, wherein
said key mates with said keyway when said containment bag is
properly oriented within the drum.

23. An apparatus according to claim 22, further
comprising a plurality of thin elongated stiffeners spaced
apart and vertically disposed along the walls of said
containment bag.

24. An apparatus according to claim 22, wherein
said neck is made of a plastic material.

25. An apparatus according to claim 24, wherein
said containment bag is made of plastic material.

26. An apparatus according to claim 23, wherein
said stiffeners are made of a plastic material.

27. An apparatus according to claim 24, wherein
said neck is made of polyethylene.

28. An apparatus according to claim 25, wherein
said containment bag is made of polyethylene.

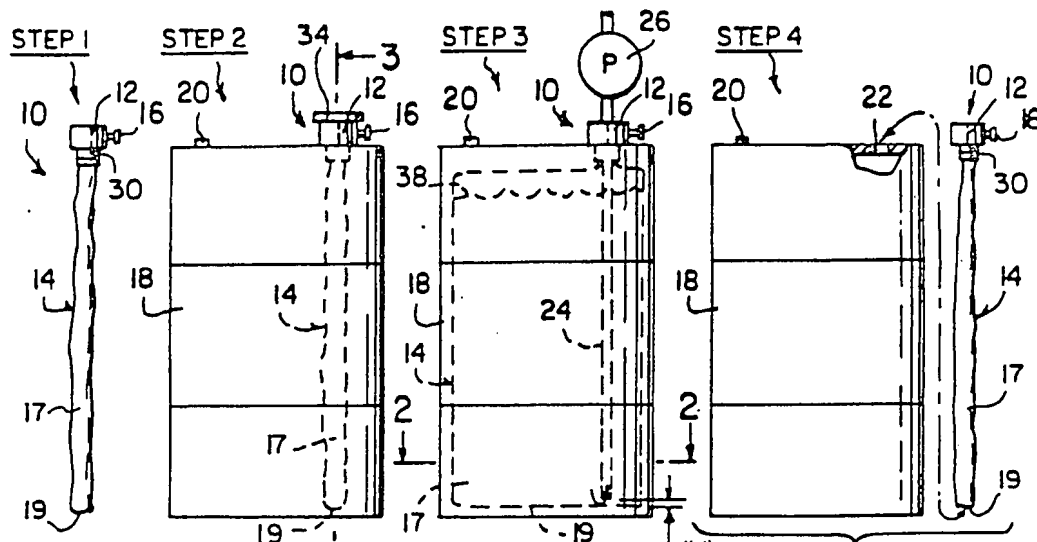


Figure 1 Figure 1A Figure 1B Figure 1C

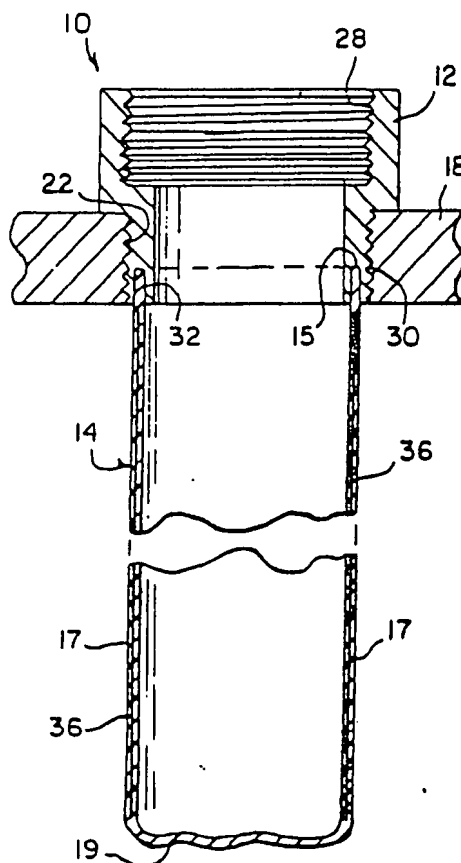


Figure 3

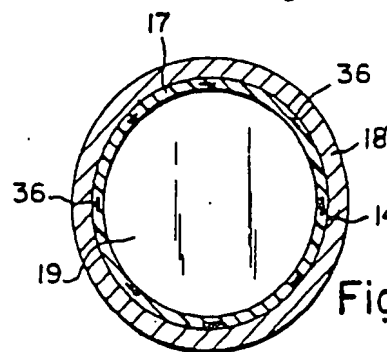


Figure 2

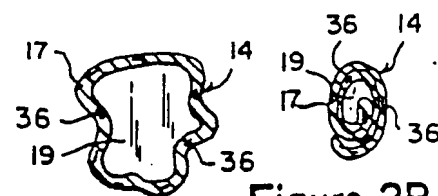


Figure 2A Figure 2B

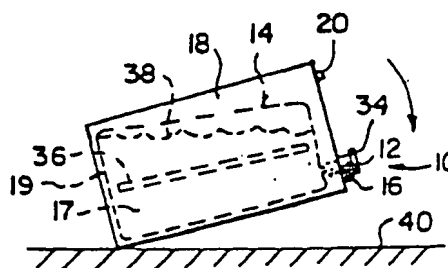
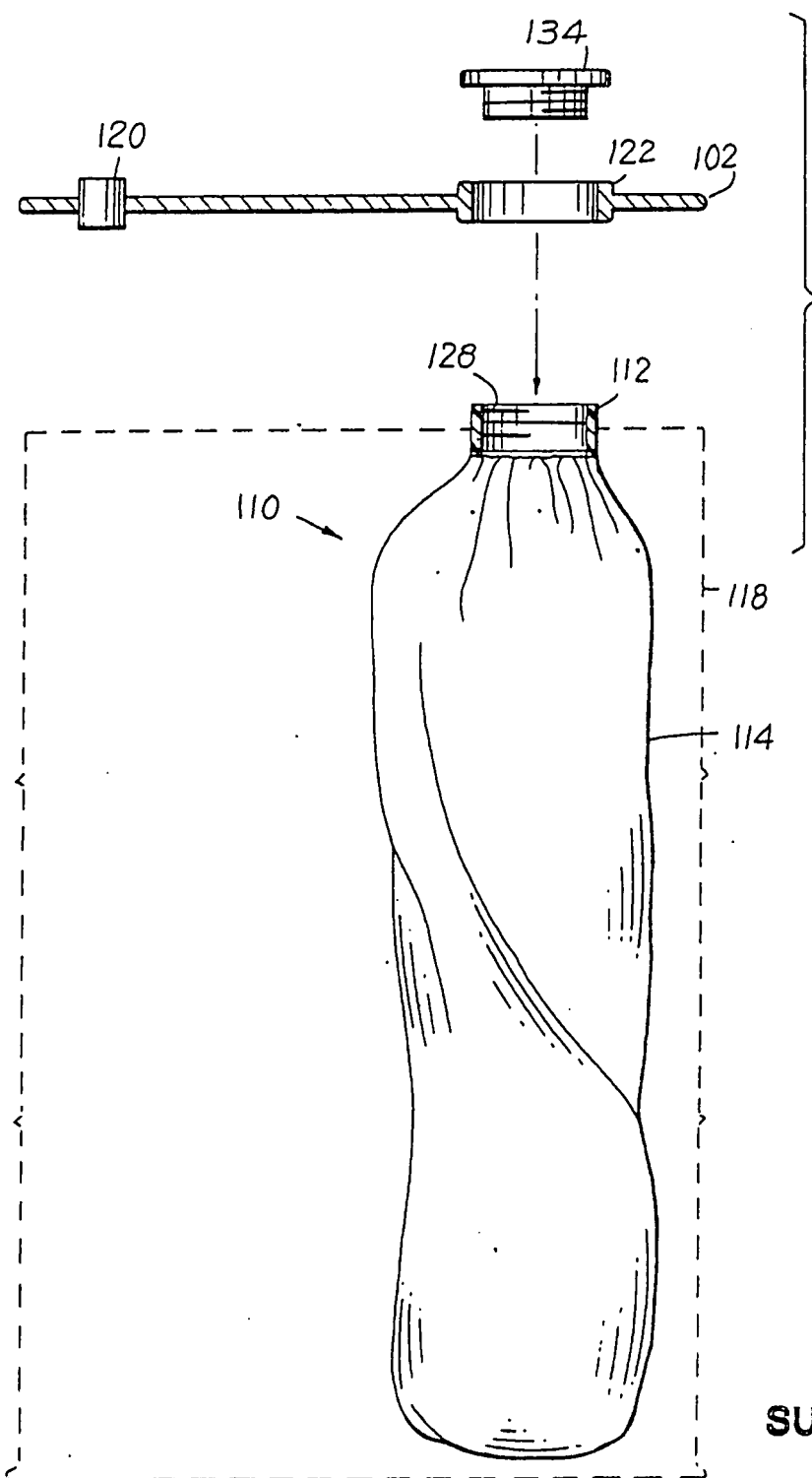


Figure 4

FIG. 5^{2/4}



SUBSTITUTE SHEET

3/4

FIG. 6

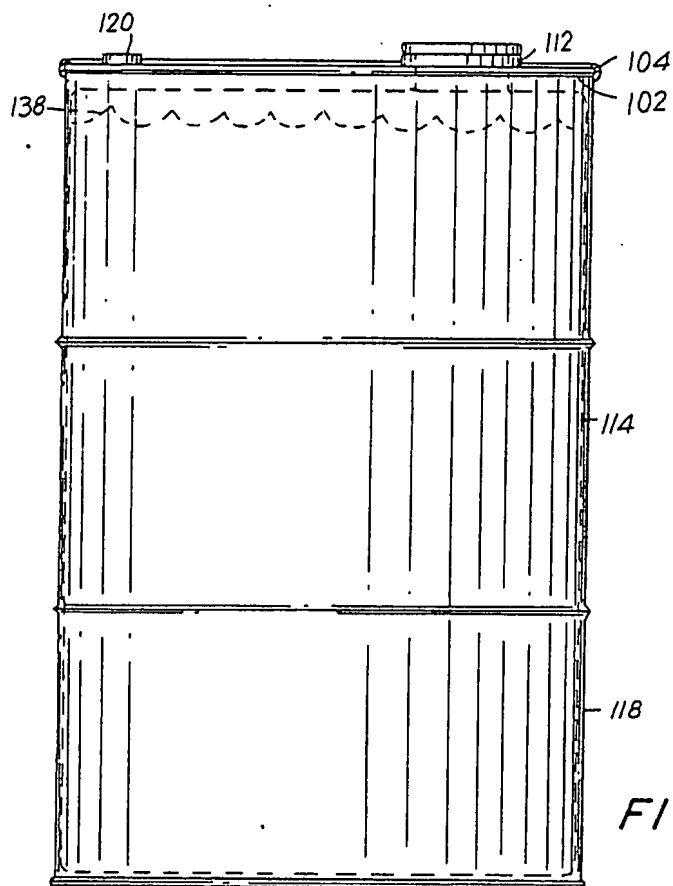
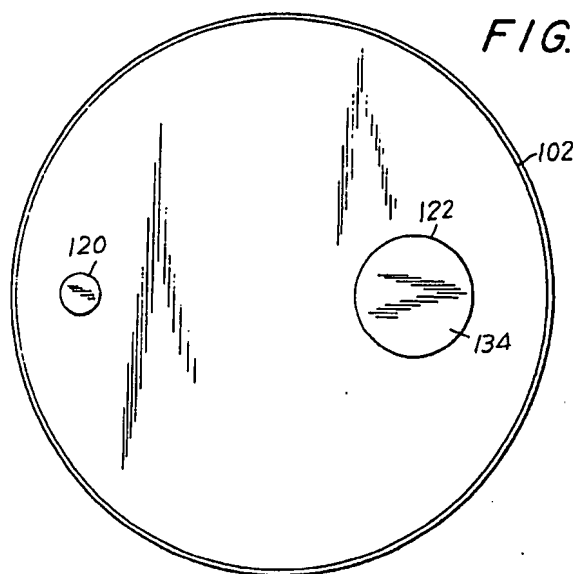


FIG. 7

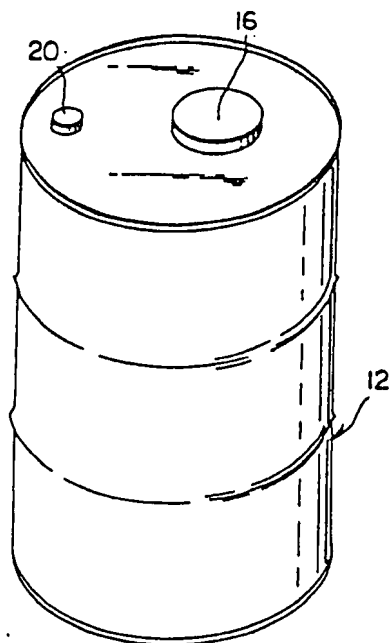


Figure 8

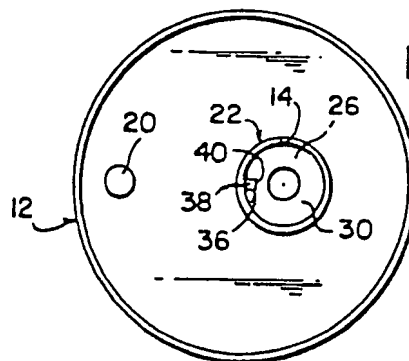


Figure 11

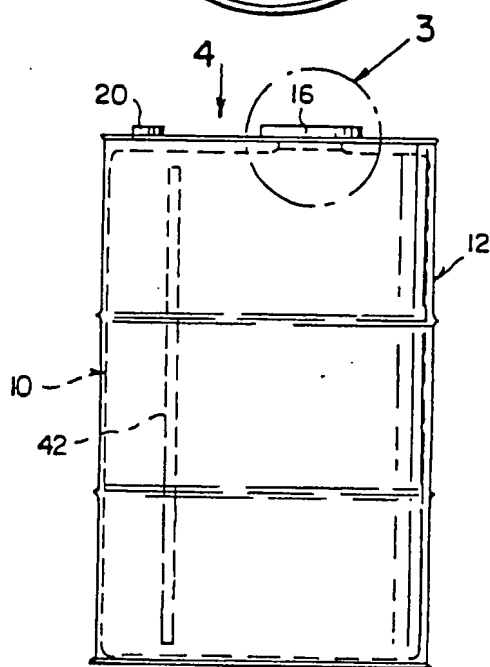


Figure 9

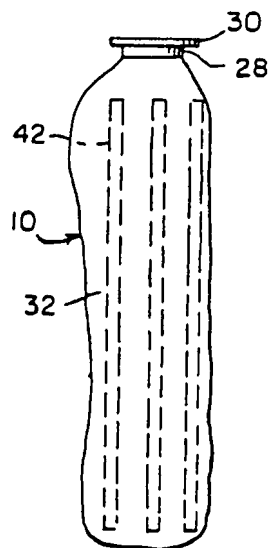


Figure 12

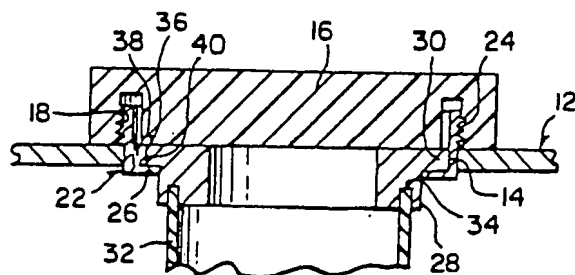


Figure 10

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US88/01333

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC(4) B65D 90/04,33/02																							
II. FIELDS SEARCHED <div style="text-align: center;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%; border: none;">Classification System</td> <td style="border: none;">Classification Symbols</td> </tr> <tr> <td style="border: none; text-align: center; vertical-align: middle;">US</td> <td style="border: none; vertical-align: top;">220/5R,403,404,465 383/119</td> </tr> </table>			Classification System	Classification Symbols	US	220/5R,403,404,465 383/119																	
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Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched ⁸																							
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category [*]</th> <th style="width: 60%;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 30%;">Relevant to Claim No. ¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Y</td> <td>US A 2,987,216 (Fletcher) 6 June 1961 (entire document)</td> <td style="text-align: center;">1-28</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>US A 3,167,210 (Carney, Jr.) 26 Jan. 1965 (entire document)</td> <td style="text-align: center;">1-28</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>US A 4,560,085 (Vom Hofe et al) 24 Dec. 1985 (entire document)</td> <td style="text-align: center;">1-28</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>US A 4,586,628 (Nittel) 6 May 1986 (entire document)</td> <td style="text-align: center;">1-28</td> </tr> <tr> <td style="text-align: center;">A</td> <td>US A 4,040,461 (Carson) 9 Aug. 1977</td> <td></td> </tr> <tr> <td style="text-align: center;">A</td> <td>US A 3,215,307 (Connell) 2 Nov. 1965</td> <td></td> </tr> </tbody> </table>			Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	US A 2,987,216 (Fletcher) 6 June 1961 (entire document)	1-28	Y	US A 3,167,210 (Carney, Jr.) 26 Jan. 1965 (entire document)	1-28	Y	US A 4,560,085 (Vom Hofe et al) 24 Dec. 1985 (entire document)	1-28	Y	US A 4,586,628 (Nittel) 6 May 1986 (entire document)	1-28	A	US A 4,040,461 (Carson) 9 Aug. 1977		A	US A 3,215,307 (Connell) 2 Nov. 1965	
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>[*] Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 50%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>																							
IV. CERTIFICATION <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> Date of the Actual Completion of the International Search <div style="text-align: center;">10 August 1988</div> </td> <td style="width: 50%; border: none;"> Date of Mailing of this International Search Report <div style="text-align: center;">12 SEP 1988</div> </td> </tr> <tr> <td style="border: none;"> International Searching Authority <div style="text-align: center;">ISA/US</div> </td> <td style="border: none;"> Signature of Authorized Officer <div style="text-align: center;">Joseph M. Moy </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center;">10 August 1988</div>	Date of Mailing of this International Search Report <div style="text-align: center;">12 SEP 1988</div>	International Searching Authority <div style="text-align: center;">ISA/US</div>	Signature of Authorized Officer <div style="text-align: center;">Joseph M. Moy </div>																	
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